SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 1369.—Vol. XXXI.] LONDON, SATURDAY, NOVEMBER 16, 1861. [WITH JOURNAL] STAMPED.... SIXPENCE. UNSTAMPED. FIVEPENCE.

TRACTION-ENGINE, FOR METALS AND MINERALS.

This invention in Traction-Engines consists in placing the driving pinion, which gears into the inside toothed-rack of the driving-wheels, either on a line with and forward, or below and forward, of the axes of the driving-wheels. This pinion slides between horn plates, or other suitable guides, in the framing, in a vertical direction, to allow of the play of the springs supporting the engine when at work upon the driving-pinion. The pinion is connected with the engine by suitable wheels and pinions to produce the requisite changes of speed. The axles of the driving-wheels also slide in the framing by having the axle-boxes sliding in horn plates, or other suitable guides, curved with a radius equal to the distance of the driving-pinion first mentioned, from the centre of the driving-wheel. When the engine is standing still the weight taken by the driving-wheels is supported by the springs at their centre; but so soon as the engine is put in motion, according to the power required to move the engine and its load, so much of the weight of the engine is transferred from the centre of the driving-wheel to that point in the circumference where the driving-pinion gears into the toothed-rack upon the driving-wheel, and the amount of weight thrown upon the pinion is taken off the centre of the driving-wheels, so that if the driving-wheels were fixed the whole weight of the engine would be transferred from the centre towards the circumference. By this arrangement of the driving-pinion, the weight is transferred from the centre of the wheel, or line of direct vertical pressure, towards the circumference, to a distance equal to the horizontal distance between the centre of the driving-wheel and the driving-pinion, by which the wheel is compelled to roll forward or slip with a power equal to the weight of the engine, acting upon a lever whose length is equal to the horizontal distance between the centre of the wheel and the pinion.

The improvements in carriages to be drawn by the traction-engine are as follows:—A toothed-rack is fitted inside the felloe or periphery of the hind wheels, or both fore and hind wheels, having a pinion gearing into and fitted in a similar manner to the engine before described, and driven by a horizontal shaft extending along the bottom of the carriage, and connected to the engine by suitable couplings and gearing. The improvements in wheels for traction-engines and other common road carriages consist in placing within the rim or felloe of the wheel a raised rail, the spokes being placed either within or without the centre of the felloe, or both. Suppose the wheel to be divided into four quarters by lines drawn horizontally and vertically through the centre, within the wheel a frame is placed with two arms; this frame is keyed or bolted to the axle. On the aftermost arm a grooved roller is placed bearing against and embracing the raised rail within the felloe of the wheel, at a point either upon or a little below where the horizontal line separating the upper from the lower aftermost quarter cuts the felloe, and on the other arm is placed another grooved roller, bearing against and embracing the raised rail within the felloe, at or near a point about the middle of the lower foremost quarter. By thus constructing the wheel a portion of the weight is (by the forward pull of the carriage) thrown in advance of the line of direct pressure of the wheel upon the ground.

In ascending inclined roads, the weight being by the action of the engine transferred horizontally to a point forward of that point where the wheels bear upon the ground, the back and centre being at the same time released from the weight, the wheel is compelled to roll forward or slip, but if shoes be placed under the wheels, in a manner somewhat similar to Boydell's patent of 1854, by the great increase of bearing surface, the slip is impossible, except the rate of inclination be so great that the whole mass of the engine and load slides bodily down the hill.

In passing over large stones and other obstacles the advantage of this principle is also felt, as by the weight being taken off the centre the wheel is free to cant over the resistance.

It having been shown that so long as the weight is kept upon the fore part of the perephery of the wheels they must roll forward—let us take for example, that it be required to take a load of 50 tons up a hill two miles long, having an inclination of 1 in 5, at the rate of two miles per hour. Suppose the engine to weigh 25 tons, making a gross load of 75 tons, the driving-wheel being 14 feet external diameter, and the point where the pinion bears upon the toothed-rack being 6 ft. 3 in. from the centre, and the inclination of the road 1 in 5, the weight of the engine is thrown 4 ft. 8 in. in advance of that point where the wheel bears upon the ground; and in the carriages, the wheels being 8 ft. diameter, and the bearing point of the pinion 3 ft. 6 in. from the centre of the wheel, the load in the carriage is thrown 2 ft. 7 in. in advance of where the wheels bear upon the road. Two miles per hour will give 176 ft. per minute as the rate at which the load must be lifted: 33,000 lbs. raised 1 ft. high in one minute =1-horse power; 187 lbs. raised 176 ft. high in one minute=1-horse power; 75 tons, or 186,000 lbs., divided by 187 lbs.=required horse-power to raise 75 tons 176 ft. high in one minute=898-horse power. Taking the diameter of the cylinders at 20 inches, number of strokes per minute at 100, length of stroke 24 in., steam-pressure 250 lbs. per square inch, and two cylinders, then by Watt's rule for ascertaining horse-power—Diameter of cylinders, squared, × ·7854 × velocity of piston, in feet per minute, × steam-pressure in lbs. per square inch, and this divided by 33,000, or in figures $\frac{20_2 \times \cdot7854 \times 400 \times 250}{33000} \times 2$ cylinders will give 1904-horse power, from which substract one-half as power lost from various sources, leaves 952-horse power available, and a surplus of 54-horse power over and above that required to raise the 75 tons 176 feet in a minute. Under these extreme circumstances the work could be effected by the evaporation of 580 gallons of water, and the consumption of 515 lbs. of coke. It may thus be seen that by proportioning the horse-power to the load, as shown in the foregoing calculations, it is possible to ascend any incline that is not so steep as to cause the whole to slip bodily downwards. As it may be said by some that an engine of 25 tons could not be worked on the common road, we will give the traction power of an engine of 12 tons that will come within the requirements of the Locomotive Act, 1861. Taking the diameter of its cylinders at 10 in., stroke 20 in., steam-pressure 25 lbs. per square inch, revolutions 200 per minute, and two cylinders, and working out its power as before exemplified, it would take up the same incline of 1 in 5, at a speed of two miles per hour, 36 tons gross, or 24 tons nett.

Now, as the large engine exerts a tractive or dynamic force of 75 tons, and the smaller of 36 tons, and as, according to Babbage, the resistance of a perfectly level good road is one-tenth of the load, consequently the former would draw 750 tons and the latter 360 tons on the level, at two miles per hour, but from the length of the train of carriages required to convey so great a load, it would not be practicable to such an extent.

As an example of the advantages of steam haulage on common roads over horse-power, we will take the present cost of haulage between Hereford and Hay, a distance of 20 miles.

Coals can be obtained in Hereford at all times of the year for 10s. per ton, and at Kington, 14 miles from Hay, for the same price. At Hay, coals brought from Kington by tramway cost 20s. per ton in the summer, and from Hereford by wagon 22s. per ton, but in the winter they range from 30s. to 40s. per ton. The charges for ordinary merchandise from Hereford to Hay is from 18s. to 24s. per ton, and light goods 30s. to 36s. per ton. The actual cost to the hauler for horse-power is not less than 6d. per ton per mile, exclusive of turnpike tolls, and under the best circumstances. Now, we will endeavour to show what the actual cost would be of haulage per ton per mile by the large engine before-mentioned, taking 50 tons 20 miles. Taking the consumption of fuel at 515 lbs. for two miles, as previously stated, 20 miles will give 5150 lbs., or 2 tons 3 cwts., of fuel consumed, and then calculating as under—

2 tons 3 cwts., at 10s. 6d. per ton	£1	2	6
Wages	0	16	0
Oil, grease, &c.	0	2	6
Wear and tear, 1s. per mile	1	0	0
Interest on cost (4000*l.*) at 5 per cent. for one day	0	13	4
Turnpike tolls (under new Act) about	2	5	8=£6 0 0

Then as 50 tons carried 20 miles costs 6*l.*, 50 tons carried one mile will cost 6s., and 1 ton carried one mile will cost less than 1½d., but say 2d., showing a saving by steam over horses for haulage purposes, where a full load can be maintained, of 300 per cent.

In this illustration, however, the consumption of fuel has been computed supposing that the engine was working up an incline of 1 in 5 for the whole distance, but for an ordinary road, such as that from Hereford to Hay, the steepest incline on which is 1 in 11, and that only for a short distance, the consumption of fuel would be reduced by one-third to one-half of that stated. The rate of speed has been given as two miles an hour, but that is only intended for the steep inclines, as on an average road a speed of 8 to 14 miles an hour could obviously be maintained.

The advantages of the traction-engine and train to those whose mines or quarries are so distant from any outlet for their produce as to render them of little value need no further illustration than the foregoing.

MINERAL DEPOSITS.

THE LAWS WHICH REGULATE THE DEPOSITION OF LEAD ORE; *illustrated by an Examination of the Geological Structure of the Mining Districts of* ALSTON MOOR. By WILLIAM WALLACE. E. Stanford, London.

That the apparent confusion on the surface of the Earth is resolvable by careful study into a system of order, is now generally admitted. That the complicated conditions observable in mineral lodes, and metalliferous deposits, are capable of being reduced within the limits of some general law is also allowed by most thinking men. That the Earth has undergone vast changes is evident; and, that since many of these have been catastrophes on the grandest scale of action, we can well understand how the laws which have regulated the ordinary phenomena have been masked by the effects of the larger disturbance. Consequently, any one who enters on the study of geological or mineralogical phenomena will have to employ all the powers of well-trained reason to remove the impediments in his path.

The study of the laws regulating the deposition of minerals is peculiarly beset with the difficulties which we have indicated. Hitherto our progress has been slow in elucidating truths in relation to the formation of lodes, from the circumstance that Science and Experience have not gone to work in union. Science, or rather that which has been called by its name, has stood upon the surface and speculated on the probabilities, of such and such an action, having been produced as the result of certain causes, supposed to be in operation in the depths of the earth. Experience has looked at Nature's works, and wanting the guiding light of Science, has wandered from the truths, which could have been read inscribed on the tables of stone. The Philosopher has kept aloof from the Miner; he has not made himself familiar with the mine, and hence he has not known the real conditions of the phenomena which, in his vanity, he has attempted to explain. The Miner has studied, in his own way, with great attention, the varied conditions of the mineral lode, and of the "country" in which it is found, but, being ignorant of the first principles of physical science, and knowing nothing of chemistry, he has not been able—indeed, he has rarely attempted—to explain the causes in operation.

In the author of the book before us we appear to have found a miner who has availed himself of modern science, and who, by endeavouring to interpret his observations according to the strict rules of inductive philosophy, has produced a truly remarkable work. Mr. Wm. Wallace has been from his early boyhood an Alston Moor miner, and, as such, is well known to everyone in any way connected with that important mineral district. We were not, however, prepared to find so much philosophy in the wild and elevated region of Nenthead as we discover in the pages of a work which cannot but be regarded of the highest interest. On the very point with which we have been dealing, we are assisted by our author's remarks; which, as the result of the carefully regulated thought of a practical man, we transfer to our pages:—

> In the North of England the mining agents are chiefly selected from among the workmen, on the supposition that their experience will enable them not only to propose suitable trials, but also to plan and direct the mining operations in the most effective and economical manner. Now, the experience of the common miner relates chiefly to the latter: and is concerned with the sinking of shafts, making of rises, levels, &c. By long-continued and daily exercise he attains a degree of skill, in penetrating the hardest rocks, in working and timbering safely those of a soft and loose character, truly surprising. As might reasonably be expected from the appointment of men trained in such a school, the *art* of mining, so far as it relates to the construction of works, for proof of the veins, has been bought to a high degree of perfection.
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> But it is manifest that employment in such labours affords no suitable training for those whose province it is to investigate the most difficult problems of geology and mineralogy. It is only in the school of Bacon that the mind can be properly disciplined for such enquiries. Habits of close observation must be combined with the intellectual power of conducting rigorous processes of inductive and deductive reasoning; and this power is only attained by profound study and reflection—by a long course of philosophic cultivation and logical habits of thinking. It may be safely affirmed that few working miners possess the requisite time and means for prosecuting such studies. Hence, while the *art* of mining has attained great perfection, the *science* of mining scarcely exists, and the opinions of practical men on the subject are based upon an empiricism of the very lowest order.
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> Should anyone doubt the correctness of this statement, let him collect into a series of aphorisms all the exact knowledge we possess on the subject of metallic deposits in veins, and he will doubtless find the discordance in Nature to be most remarkable, and that scarcely a single proposition has yet been established that is not a subject to numerous and unaccountable exceptions. That the deposition of metallic substances in veins is an exception to that law and order which regulates the succession of all natural phenomena properly understood, cannot for one moment be entertained by anyone thoroughly convinced of the universality and uniformity of Nature's laws. An intermixture of effects, or a phenomenon the resultant of many concurring causes, may, to the superficial observer, appear fortuitous, discordant, and mysterious; but this mysteriousness should not prevent it becoming the subject of earnest enquiry. Mystery haunts not the domain of philosophy—"Where science begins there mystery ends."*
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> The impossibility of arriving at any knowledge of practical value respecting ore deposits in veins, is avowed by those who with singular inconsistency attach the greatest importance to individual experience. Even some, occupying high distinctions as directors or proprietors of mines, affirm, without qualification, that it is impossible to see through solid rocks, or they summarily dismiss further consideration on the subject by remarking that the old adage current among miners expresses an important truth, namely—
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> "It is *only* by cutting the ground
> That the metal is found."
>
> The Cornish miners express their doubts by a similar phrase:—
>
> "Where it is, there it is."
>
> If these are not the apology of indolence and ignorance, they certainly are the utterances of despair.

It will be well understood by all who read this quotation, that we have to deal with the work of no ordinary man. It is not possible for us to do justice to the subject within the limits which we can devote to its consideration. A mind peculiarly fitted for the task, so situated that every opportunity for observation was afforded, devotes itself to the solution of a great problem. For 14 years this has been the business of all the leisure which was left to a man who had the management of very extensive mining works. This leisure has been well employed: in 1847, says Mr. Wallace, "I commenced copying numerous plans of the Alston Manor, and the adjacent ones, and resurveyed carefully the whole of the Nenthead district, both internally and externally." Since that period the investigation has been extended over the whole of Alston Moor, and the result is before us.

In continuing in his introduction the history of his investigations, the author says—

> A few years later I had some reasons for concluding that increased responsibilities in connexion with the Nenthead Mines devolved upon me. I then began to investigate the matter still more carefully, and endeavoured to look upon the phenomena connected with the rich portion, and those connected with the poor portion of the same vein, as two distinct machines, each having separate functions to perform. What these were, was the problem attempted to be solved. Whether this is done correctly or not will remain for the scientific reader to determine. The subject, however, has cost me much labour and thought; and should I not succeed in unfolding a principle of causation, and that one the most important to mining interests, I may be allowed at least the credit of collecting and arranging a large number of facts illustrating some other principle *that is true*. It may, however, be observed that the principle of causation, which the following pages, but more particularly those of the second book, are intended to unfold has enabled me in most instances to anticipate the results of trials made in the Nenthead veins in the upper beds.

The clear and satisfactory manner in which our author developes his views may be judged by a brief statement of his plan. He commences with a careful examination of the geology of Alston Moor, especially *of the laws which have regulated the deposition of the Mountain Limestone; of the elevation of the rocks of Alston Moor to the position they now occupy, and the laws which have regulated the denudation of the country.* He then proceeds to consider *the laws which regulate the formation and direction of veins.*

The second book is devoted to a very careful consideration *of the laws which regulate metalliferous deposits, illustrated by an examination of the lead veins or lodes of Alston Moor.* This book is most complete, and whether we accept Mr. Wallace's theory or not, his record of the phenomena observed in the veins of Alston Moor is of the utmost value to every practical miner. That we may convey, although we can do so but very imperfectly, some idea of the views entertained by Mr. Wallace, we quote, in the first instance, his conclusion to the first book, which deals with the geological phenomena:—

> Having now brought the enquiry to a close, we shall state, in a few aphorisms, the conclusions arrived at.
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> 1.—The strata were originally thrown down in nearly a horizontal position. This could only be effected by an equal subsidence of sea-bottom throughout wide areas, and that during the whole period occupied in the deposition of the Old Red Sandstone, Mountain Limestone, and Coal Measures.
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> 2.—That at the close of this period, and before the Permian rocks were deposited, this vast thickness of rocks were thrown out of their horizontal position by forces of subsidence or elevation, probably the latter, and the cross veins formed, these being simply fractures parallel to lines of greatest effect produced.
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> 3.—Afterwards the great axis of elevation, which commences at Crossfell and extends eastward, was formed, and with it a series of east and west veins, the formation and direction of which evidently depend upon the tension the strata were subjected to by unequal elevation, and the irregular bendings of this line of greatest intensity of force, as indicated by its effects. When this took place the Coal Measures had not been removed from the Millstone grit.
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> 4.—The denudation of the Coal Measures now took place, and also the formation of the Permian rocks, the action of the denudatory forces being regulated by the lines of greatest elevation of the rocks, the Coal Measures being entirely swept from off broad areas of country. During the period in which this immense mass of matter was removed the whole series of sedimentary strata comprised between the Permian and the Pleiocene, inclusively, were deposited in the bottom of the surrounding seas. At its termination the tops of the Penine mountains, and those extending eastward from Crossfell to beyond Kilhope Law, were islands dotting the surface of the ocean, their summits being at least 1800 ft. lower than at present. From these ice-bound islands masses of ice were floated off during the summer, to be dashed and broken on tempestuous coasts. What a contrast to the mild atmospheres and splendid vegetation of the Carboniferous period. Numerous races of animals had flourished and passed away, and the majority of species now inhabiting the earth had come into existence. At the termination of the Glacial period the whole of the district between the Penine fault and the German Ocean was slowly elevated, in a manner analogous to the slow and equal subsidences throughout wide areas, which took place when the strata were deposited, the effect of the elevatory force being inversely proportional to the distance from the Penine fault. My convictions are that the axis of elevation and associated mineral veins were scarcely, if at all, affected by this last great upward movement. There is some reason to conclude that the great sulphur vein is later formed than the east and west veins. Numbers of the latter, even of a weak character, are found on each side of the former; on account of the acute angle made by the intersections of these veins, this could hardly have occurred had they all been formed contemporaneously; yet at the close of the Glacial period the great sulphur vein contained the same quartz minerals it does at the present time. Again, had this vein been re-opened and further dislocations been effected after this epoch, lines of precipitous cliffs must have been formed at several places where hard rocks are lying near the surface. Such is not the case; the surface, with the exception of a few conical hills, is smoothed off without being modified in the least degree by the existence of this powerful vein in the rocks below. Nor is it at all probable that a line of cliffs on the summits of the mountains could be worn and eroded by pluvial and hyemal agencies, since the ribs of quartz contained in this vein and the hard sandstones composing its walls or sides are nearly as indestructible as the granite boulders, which must have been exposed to the action of these agents on the opposite side of the mountain.
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> 5.—If, since the glacial epoch, the district of Alston Moor has been raised some 1800 ft., it is evident that this must have been effected by a more wide-spread or deep-seated force than that which produced the axes of elevation then in existence. It appears also that during this upward movement the dislocations occurred chiefly, if not entirely, at the *great lines of fault*, as lines of least resistance; wide tracts of country being uniformly raised, the axes of elevation which traversed it were not modified, nor further dislocations effected on the lines of the correlated mineral veins. It will be observed that the antecedent, or cause of all these changes and resulting phenomena, is simply the subsidence and elevation of a portion of the earth's crust. But what is the cause of this oscillation, and what are the laws of its action? To these questions science has as yet furnished no satisfactory reply. Attempts have been made to establish a relation in time between parallel mountain chains or axes of elevation. But the grouping of effects based on this relationship throws no light on the laws of causation, and until this is determined by induction it seems probable that the subject will continue to be shrouded in much obscurity. Whatever law regulates the action of these forces, we may rest assured that, like all the rest in Nature, it must be uniform and eternal, the mandate of a Supreme Being, with *whom there is neither variableness nor shadow of turning.* Or, as it has been well expressed by a profound thinker, "The searching eye of man, whether he regards his own inward being or the creation surrounding and encompassing him, is always led to the Eternal Source of all things. In all enquiry the ultimate aim is to discover that which

* Powell's Essays. "On the Unity of Worlds." Second edition, p. 62.

really exists, and to contemplate in it its pure light, apart from all that deceives the careless observer by only a seeming existence. The philosopher will then comprehend what, amidst ceaseless change, is the Constant, the Uncreated, which is hidden behind unnumbered creations; the bond of union which causes things not to fall apart in spite of their manifold divisions and separations. He must soon acknowledge that the independent can only be the constant, and the constant the independent, and that true unity is inseparable from either of these. And thus it is in the nature of thought that it finds no quiet resting place, no pause, except in the Invariable, Eternal, Uncaused, All-causing, All-comprehensive Omniscience."*

Proceeding with his enquiry, Mr. Wallace lays it down as a law *that the circulation of fluids is a law of causation essential to the deposition of lead ore;* and he then proceeds to show that the percolation and circulation of water below the earth's surface are regulated generally by *five laws.* The first general law being *"that, cæteris paribus, the quantity of water in circulation beneath the summit of mountains must be in inverse proportion to the depth from the surface, and in direct proportion to the distance from the water shed of the mountains."* The four other laws are but conditions modifying the effect of the first law.

Water percolating through the rocks, and circulating through the various channels formed in them, carries with it in solution the metalliferous salts which are deposited in the earth as metallic ores, in obedience to some general law, that deposition being regulated, according to the views put forth by Mr. Wallace, by the *rate of motion* given to the water circulating in any given fissure. This rate of motion is determinable by a careful study of the geology and the geognosy of a district; hence it is quite possible to predict, with a certain degree of accuracy, whether a lode will be metalliferous or otherwise before money is expended in its exploration. Such, we believe, is a correct statement of our author's views. If he is right in his conclusions, he has made a discovery of the utmost value to the mining interests of this country.

We are not prepared to adopt all the views put forward in this book. Indeed, we should consider any man rash, if he did do so without subjecting the problems to a most careful examination, and this can only be done in the mineral field. The book we have read with more than ordinary care, and we are bound to say that its pages carry conviction with them. The facts are undeniable, and the reasonings on those facts are of the most logical kind. There can be but little doubt that all the lead-bearing districts embraced within any of our Carboniferous systems are pretty much the same in all their physical conditions. We cannot say if the laws here developed will apply to the mineral lodes in the older rocks. Mr. Wallace appears to think that they will do so. Let us hope that this admirable book will induce some of our young and intelligent Cornish miners to institute an enquiry of a like nature, into the veins traversing the granite and clay-slate rocks. This book is accompanied by a map of Alston Moor, showing every lode that has been worked, and indicating in colours whether it has been metalliferous or otherwise. This map is most beautifully executed, and is evidently the result of a labour which could only have been given to it by a mind deeply imbued with a love for the subject, and stimulated by an earnest desire for the discovery of truth. The sections and other drawings, of which there are many, are executed with equal elegance and care. When we come to deal with the problem of the primary origin of the metals themselves, we cannot, in the present state of our knowledge, but admit that we wander without a light to guide us. We are not prepared to accept Mr. Wallace's views on this point, but these are most modestly put forward, and must command the respect and consideration of all thinking men. We hope we have said enough to induce all who wish to acquire real knowledge on a perplexed subject to study this very beautiful volume. We should not do justice to it did we not state that as an example of book production we have rarely seen anything so perfect. Paper, printing, and drawings are alike excellent, and reflect the highest credit on the publisher.

* Oersted's Soul in Nature, p. 136.

ON STEAM-BOILERS, AND CAUSES OF EXPLOSION.

By Mr. J. Hocking, Jun., of Redruth: Read at the Miners' Association of Cornwall and Devonshire.

[*Continued from the Mining Journal of Oct.* 19.]

know of no other authority than that which I have before cited on this important subject, or any other experiments from which reliable data can be obtained. I think it is of so much importance that I give the different thicknesses of plate corresponding to different lengths, taken from his work, calculated for boilers at a safe working pressure of 75 lbs. per square inch.

For tube.	10 feet long.	20 feet long.	30 feet long.
3·6 diameter.....	·516 of an inch.....	·707 of an inch.....	·851 of an inch.
4·0 diameter.....	·548 of an inch.....	·752 of an inch.....	·905 of an inch.

In tubes not hooped the above are thicknesses of plates at a safe working pressure of 75 lbs per square inch, for the different lengths, but if hooped with strong T or angle iron it will be seen that the same amount of strength will be obtained at about 3-5ths of the thickness for tubes of the greatest length. This paper would be incomplete without noticing the safety-valve. Its object is well known—to avoid an excess of pressure, and, of course, no boiler would be worked without it. In addition to these, however, pressure-gauges fixed in the engine-room cannot fail to be of great service to the enginemen, and the favour with which they are regarded where they are in use strongly recommend their further application.

I believe I have now enumerated the different appliances to our boilers for their safe working; I would, in conclusion, recommend above all others, where not in use, the glass water-gauge, if for no other reason, than that the most inexperienced could detect whether the feed was at its proper level or not (it is a fact that there are many boilers working without them); and also the strengthening of all tubes by bands of T or angle iron. Still, gentlemen, with all these precautions, a great deal must depend on the skill of the engineman in charge. The necessity of keeping the appliances (water-gauges and safety-valves above all others) clean and in proper working order, cannot be too strongly impressed on them; and, above all, their being entrusted in the hands of skilled enginemen, who have been properly trained to a knowledge of their work. I cannot conclude without drawing attention to a practice sometimes allowed, which cannot be too strongly condemned—permitting miners to change on the top of boilers. I am glad to say that in engines under our own control this is now very rare. It draws away the engineman's attention from his duty; the safety-valve gets frequently tampered with, and the results of accidents are rendered of a much more serious character.

Mr. Chairman and Gentlemen,—I thank you for the patience with which you have heard me; if there is any point on which I have not been sufficiently explicit, I shall be happy to give all the information in my power. As I stated at the commencement, I have not come before you with any new theory, but have endeavoured to call the attention of those engaged in mining to certain facts, which I feel are not so well understood, nor so generally known as they should be, and which I think this association affords the means of making known.

The Chairman said that the loss of life, as well as the loss of money, by the explosion of boilers was a subject of immense importance.

Mr. R. W. Fox observed that that day's newspaper contained an account of an accident from the bursting of a boiler, by which eight lives were lost.

Mr. Robert Hunt said that he should like to call Mr. Hocking's attention to two experiments which he especially desired he should try, as they were instructive in relation to the explosions of boilers. The first experiment was described a few years since in the *Philosophical Magazine*, and had been repeated by him (Mr. Hunt). The second was published by Mons. Donné in the *Annales des Chimie*. An egg-shaped iron vessel, or one of a still longer oval, was taken, and three holes being made at equal distances, these were fitted with stop-cocks. Water was then put into the vessel until it flowed out of the middle orifice. This was then placed over a very powerful blowpipe spirit-lamp, or the fire of a blacksmith's forge, and heated as rapidly as possible. After a short time the iron would show evidences of becoming red-hot. If now the *lowest* cock were opened, *vapour* and not *water* would flow out, while water would rush from the upper one if it were opened. This showed that by the operation of a violent heat water might be repelled from the heated surface, and supported on an atmosphere of aqueous vapour. The second experiment was to take a glass wine flask, and having half filled it with water, to boil it over a spirit-lamp. In a little time the upper part of the flask would become filled with steam, and thus the access of air was prevented, and all the air was exhausted from the water. The boiling then ceased, or rather was continued by a series of intermitting bursts. If the temperature of the water were now measured, it would be found to be considerably above the boiling point; and if at this stage, having previously adopted the precaution of surrounding the flask with a network of wire, a drop of ordinary cold water were allowed to fall into the vessel, the whole would burst in ebullition, with all the violence of an explosion, frequently rending the vessel into fragments. He believed that these two experiments would go far to explain the cause of very many of the steam-boiler explosions.

Capt. Tonkin said he had no doubt that the effects of the experiments referred to by Mr. Hunt were exactly as he had described; nor did he for a moment wish to deny that accidents in boilers had occurred from the causes which had been referred to; but still, for his own part, he believed that in nine cases out of ten they had occurred through the neglect of the engineman. He was opposed to Government inteference in the case of the machinery employed on mines, but still he thought that no boiler should be allowed to work unless supplied with a steam-gauge, so that the engineman might at any time ascertain the height of the water in it. On one occasion he was suddenly called into the engine-house, and had he been a moment later the tube of the boiler would have collapsed, and there would have been an explosion, owing to neglect of the engineman. He fortunately succeeded in blowing off the steam. If the cause of boilers bursting was that which had been spoken of by Mr. Hocking, then he could not see why the sides should not collapse as well as the roof. There was another matter which ought to be more attended to, and that was the efficiency of enginemen. It frequently happened than an old man, or a man incapacitated from doing anything else, was appointed engineman, upon the same principle that was said to be formerly acted upon in Cornwall in regard to the instructors of youth, when any old man and woman who knew nothing were selected as schoolmaster and schoolmistress. (A laugh.) One of the largest items of expense on a mine was that of coals, and he thought the consumption of these, and the management of engines, ought not to be placed under the control of any but properly-instructed persons.

Mr. Hocking said he did not wish it for a moment to be understood that he differed from Capt. Tonkin, when he stated that a large number of accidents to boilers occurred from the neglect of the enginemen; but still he thought that precautions ought to be taken to strengthen the tubes of boilers. At present they had a boiler at work in which the tube was hooped in the manner he had described, and very recently an explosion would have occurred had it not been thus strengthened.

Capt. Tonkin wished it to be understood that he did not find fault with the paper which they had just heard read, as he considered it a very valuable one.

Mr. F. Michell, of Redruth, contended that it was entirely owing to the want of water boilers collapsed in the way that had been described by Mr. Hocking. That was the result of his observation, for the working pressure of their boilers was not anything near the rending pressure.

Mr. R. W. Fox then exhibited a number of interesting mineralogical specimens.

The Chairman said there was another paper, from a working miner, containing his observations on mining, but owing to the length to which the proceedings had extended, the reading of it must be deferred till the next quarterly meeting of the association, which was to be held at St. Austell.

OBSERVATIONS on the COAL MINES of BELGIUM.—No. II.

The type of winding-engines in this district may be described as follows; I allude, of course, to the new engines which are now put up:—Double horizontal cylinders; high pressure; slide-valves, with almost no slags; diameter of cylinders, 0·75 metre; stroke, double diameter of cylinder, 1·50 metre; nominal force, 150-horse power, but capable with sufficient boilers of working up to 300. With these engines flat ropes are universally used, and for several reasons—1. Because they are safer.—2. Because, since the diameter of the drum augments gradually as the rope winds upon itself, the resistance to overcome may be made constant during the whole trip of the cage, the radius, and consequently the velocity, increasing only as the weight diminishes. The maximum average speed of these engines—that is, the entire time divided by the entire distance—is 7 metres per second. The rope is left a little longer than the depth of the pit, so that when the cage is at the bottom 4 to 6 metres of rope are run off and lie slack on the top, to give the engine time to get under weigh before the cage is lifted. Ventilation is carried on exclusively by machinery, furnaces having been for a long time abandoned in Belgium. In the pits I visited the ventilation seemed perfectly satisfactory, and I was informed on good authority that 15 cubic metres of air may be passed per second by the ventilating machinery in use in the district; this makes a trifle over 31,500 cubic feet per minute, certainly a great contrast to the enormous quantities reported in England, but still, as I have said, it seems to be quite sufficient.

The price of labour varies very much with the season. When trade is good there is throughout Belgium a general scarcity of hands, which manifests itself in the pay-sheets by an increased rate of wages. If would be hard to generalise this item, particularly when the mode of calculating the work done is taken into consideration, the men being paid per square *metre* of advance, by which system the thickness of the seam is not taken account of. The rate of pay, consequently, varies with the seam. When labour is plentiful and wages low, hewers will gain from 3·50 frs. to 4 frs., or (say) 2s. 11d. to 3s. 4d. per day of about ten hours. A large number of women and girls are employed below ground for charging the tubs at the faces and building up, and at the surface for picking over the coal. It is said that in these departments they will accomplish much more work than the strongest men could. The first cost to the companies of working the coal varies greatly, according as the circumstances in which they are placed are favourable, or the contrary. I know of one colliery where the price of labour is 32 centimes per hectolitre of coal (the hectolitre is generally calculated to weigh 90 kilos.=198 lbs. avoidupoise). But this is exceptionably low, for another colliery pays as much as 0·58 frs. per hectolitre, a sum equal to the *total* first cost of the first-mentioned establishment. The Government supervision seems to be conducted somewhat as in Great Britain. The Inspectors are called upon to examine into the facts when an accident occurs, and make occasional visits to the collieries in their districts, but allow as much liberty as possible to the managers themselves. There are two items to which they chiefly direct their attention—That the safety-lamps be kept locked, and that all the air returns *ascend;* they also exercise a supervision over the boilers, having a locked safety-valve of their own, but I know of at least one case in which the key is in the custody of the resident engineer. It is also forbidden by Government to send men to or from their work by the cage, but in all the pits I visited this regulation was only partially complied with, the men being sent down by the ladders, but always drawn up by the cage. In mines infested with fire-damp the use of a second (upcast) pit is obligatory. The "safety pillar" of the Prussian Government engineers is not required, but in the *cahiers des charges* of some companies it is enacted by themselves.

III. These generalities being disposed of, I will now proceed to give more detailed information respecting the particular pits which I inspected, commencing with Produit Pit, No. 21, near Cuesmes, on the Mons and Hautmont line, as it will furnish an example of workings *en grand plateur.* The concession to which this pit belongs is of 1100 hectares, or a little over 2700 acres, reckoned horizontally. The coal is reached by six pits, all of which, however, are not worked. No. 21, the pit under present consideration, strikes three workable seams, named respectively, and commencing with the upper one, *Carlier, Petit faux Corpes, Grande Veine à Launo.* These seams are all cut by a *bouveaud,* or stone drift, at distances of 300, 150, and 93 metres from the pit bottom. Their compositions are as follows:—Carlier seam (from the roof downwards), 15 centimetres of good coal; 10 centimetres of soft bad coal; 50 centimetres of good coal. Total thickness of seam, 80 centimetres; total coal, 70 centimetres. The next, or Petit faux Corpes, has 0·20 metres next the roof of good coal; then 0·05 metres bad coal; and finally 0·25 metres good coal. Total thickness, 50 centimetres; total coal, 45 centimetres. The Veine à Laune has 0·40 metres poor coal next the roof; then 0·40 metres good coal; then 0·40 metres stone; and lastly 0·40 metres good coal. Total depth of bed, 1·60 metres; total coal, 0·80 metres. I have already mentioned that the Belgian coal is all worked on the long wall system. In the present case, the inclination of the seam being of only 12 to 15°, the galleries running up to the working faces are at right angles with the levels. It will be seen further on that in other collieries the inclinations are generally so steep, even in plateau workings, that it is necessary to run these galleries obliquely up to the faces, in order to diminish the slope. Even in the present case, when the tubs are put by hand (in the absence of self-acting inclines) the grade of 12° to 15° is sometimes found a little steep, with a four-hectolitres tub. They accordingly, in these places use wooden rails, instead of the ordinary metallic chair rails, with a view to augment the friction. At intervals, self-acting inclines are put up. On these the chair rails are replaced by tram plates, composed of lengths of angle-iron, which are less likely to allow the trucks to untrack. They use on these planes simple horizontal pullies of a small diameter, instead of drums, with the break applied to a circumference concentric to the groove. I noticed, with astonishment, that not only here, but also at other collieries I visited, common hemp ropes are used for the planes. In the Carlier seam the levels are driven about 50 yards apart, and the working faces are about 10 yards broad, so as to accommodate five hewers, a man to every 2 yards being the usual allowance. The coal is hewn in a very intelligent manner. The mode pursued varies frequently in different parts of the same seam, according as the character of the bed changes. In the Carlier seam the coal is generally corved at the top, and a massive iron crow inserted in the band of soft coal already mentioned, by means of which the strip of coal 15 centimetres thick, which overlies it, is prised out. The under coal is then taken out in the same manner, by driving the lever in at the bottom, and working over any old stick of timber as a fulcrum. Sometimes, however, it is the band of poor coal which is corved out first, chiefly, I infer, when it is of too inferior a nature to be mixed with the good coal. The hewer supports the coal and roof when he is working with props of timber, which he removes as the work advances. The timber of the rolley-ways, however, is never, or scarcely ever, removed; in fact, the galleries themselves, when abandoned, are generally completely *remblayées,* this precaution being absolutely necessary from the nature of the cover. The hewers in this seam (Carlier) were getting, I was informed, 0·70 fr. per square metre, thus earning from 2·80 to 3 frs. per day by hewing some 8 or 9 tubs, each tub containing some 4 hectolitres. (The hectolitre, as its name indicates, is a measure of 100 litres, the litre being a cubic decometre. The hectolitre of coal is calculated to weigh, in round numbers, 90 kilos.=198 lbs. The four hectolitre tubs contain, therefore, each 792 lbs., or a *strong* 7 cwts. This is the standard capacity of the Mons tub.) The girls who load the tubs at the working faces are paid one centime per hectolitre. They em ploy in the two shifts some 600 hands, and 12 very large draught horses, of which 8 are constantly at work. The putter sits in front of the train, holding a single rein, which is attached to a *curb bit,* an unnecessary precaution, one would think, though I noticed that the chain hung very slack; so it does not probably incommode the horse much. They keep a full stock of ready-made shoes below ground, and have a shoeing rack fitted up near the stables, so that the operation of shoeing is performed on the spot. The stone drift by which the seams are cut is 2 metres high above the rails (originally, though it generally sinks considerably), and 1·50 metres wide, costing in the slate 90 frs. and in the sandstone 130 frs. per running metre. For heightening the main levels, or *costeresses,* in the Petit faux Corpes, they paid 3 frs. the running metre, and 2·25 frs. for the same operation in the rolley-ways. When the timbering is subjected to great vertical pressure they pack the space between the roof and the crown trees with branches and old small timber, which greatly relieves the strain. All necessary tools are furnished gratis by the company, but when broken they are paid for by the men. A certain number of tools is furnished to each working face, and passed to the account of that face, each tool bearing its number. Whatever breakage occurs is then charged to the entire gang working at that face. Lamps, also, are furnished gratis. This was the only colliery I visited where open lamps were used.

The extraction from this pit, 450 metres deep, with an engine of 120-horse power, 600 hands, 12 horses, with 2 yards of coal lying in three seams, and a cage carrying four tubs in four stories, is from 4000 to 5000 hectolitres per day, or from 360 tons to 440 tons. At day the cage stops four times at the keeps, and the four tubs are taken out successively, but underground they are all run in and out at once, from separate stages, connected with the stone drift by inclined planes, situated on the sides of the pit bottom. The tubs for the upper and second stories of the cages are run on by hand, but the inclined planes, running down to the stages for the lower stories, being longer and steeper, are worked by counter weights. These counter weights are placed on narrow trucks, running on rails laid *between* those on which the tub runs, the weight passing under the tub, the rails for which are raised by being placed on the heads of posts driven in the ground. The skates for the shaft are of oak, 12 by 10 centimetres. Skates are generally placed in this district so as to guide the *ends* of the cage, and not the *sides,* except where the pit is too small to do otherwise, as this position gives greater stability. The skates are broken off at the surface, so as to allow the tubs to be withdrawn, and side skates substituted for a distance of about 6 yards.

[*To be continued in next week's Mining Journal.*]

MINING IN AUSTRALASIA—MONTHLY SUMMARY.

Melbourne, Sept. 26.—In our last monthly summary we alluded principally to the rush to the newly-discovered gold fields of New Zealand, since which the exodus has continued unabated. Up to this day about 11,000 men have sailed from Melbourne, and there are as many vessels on the berth to carry 3000 more; and as fast as vessels are discharged they are chartered for Otago; steerage passages have, consequently, advanced from 6*l.* to 9*l.* per head. The news so far received leads us to believe that New Zealand will become a payable and extensive gold field, but the numbers now proceeding there will sadly overpeople the ground at present discovered to be auriferous, and must end in ruin and disappointment to many. The quantity of gold brought from Otago during the month is as follows:—*Oscar,* steam-ship, 780 ozs.; *Omeo,* ditto, 6900 ozs.; *Aldinga,* ditto, 2400 ozs.—in all, 10,080 ozs. The escort arrived in Dunedin the day before the *Aldinga* sailed with upwards of 11,000 ozs. of gold. Up to the sailing of this steamer the whole country was covered two or three feet deep in snow, so that the miners had not a fair chance in prospecting the surrounding districts. It will be at least two months before any reliable information can come to hand on which a sound opinion of the value of this discovery can be based.

The progress of our own gold fields has been of a much more satisfactory character of late; for the general success of the miners on several of our older gold fields, and the further development of previously known auriferous districts, have resulted in a very fair yield for the month, amounting by escort return to 189,830 ozs. of gold. The total population of our gold fields is 255,152, of whom 110,226 are engaged as miners, and of these 24,607 are Chinese. The actual quantity of auriferous ground worked over in the different districts is as follows:—Ballarat, 71½ square miles; Beechworth, 66¾ ditto; Sandhurst, 107 ditto; Maryborough, 115 ditto; Castlemain, 162½ ditto, and Arratt, 39 ditto—in all, 451¾ square miles; a mere flea-bite out of the 30,000 to 50,000 square miles of known auriferous country.

We are now possessed of a "People's," or democratic Government, who are determined to give the miner a chance of settlement in the country, and for this end they allow a miner to lease on moderate rent 20 acres of land for seven years, renewable, with the right of purchase, at 1*l.* per acre, at any intermediate period; and, also, for agricultural purposes, outside an area of 7½ miles around a gold field, any person may lease from 40 to 160 acres of land for seven years, at 2s. 6d. per acre per annum, with a right of purchase at 1*l.* per acre. Thus, for the first time since this country became inhabitable, the people are allowed the chance of settling on their own farmsteads.

At Glengower the rush promises to turn out well, a fresh run of gold having been found in the Old Stock Yard Gulley, from which those first down were obtaining returns of 4 to 6 dwts. per tub. No extraordinary yields are reported from any of the reefs, but rumours exist of a very rich vein having been struck on the Glamorganshire.

There has been a new rush to Champagne Gulley, New Daylesford, in consequence of the re-discovery of a gutter that was lost some years since, the yield of which is now reported to be something extraordinary; however that may be, a claim on the New Adam's Reef, close by it, is yielding enormously; one crushing of 105 tons having produced 1230 ozs. Within a few days, each shareholder in this claim has received 12 lbs. weight of gold as his portion of the produce.

A new rush broke out lately at Burnt Creek, where both deep and shallow sinkings are prosecuted with every appearance of success.

Inkermann, a place about five miles from Dunolly, is looking more lively than for some time past, about 1800 miners being employed on a new lead lately discovered there.

C. Leicester, Consulting Mining Engineer.

Sydney.—The letters by the present mail state that the strike of the colliers at the Newcastle Mines continue, and that the proprietors had in consequence resolved to obtain fresh men from England. Meanwhile, it is satisfactory that a discovery which had been reported of very extensive coal fields in California, near San Francisco, is calculated to lessen the export demand, and to cause the men to repent their combination. The home supply of breadstuffs this year in the colony is good, but some excessive quantitites seemed likely to be poured in from California. The ship *Sovereign of the Seas* had been burnt in port, with a large cargo of goods, among which was a quantity of railway iron. The New South Wales Government had sold 40,000*l.* of their debentures, at prices ranging from 98½ to 99¼. With regard to the New Zealand gold fields at Otago, it appears that the increasing reports of their riches had drawn many persons from Sydney, but that the chief rush was from Victoria, whence 10,000 miners had already taken their departure. The fields appear to be of great extent, and, although the affair will most probably end in some disappointment, the disparaging statements of the Melbourne journals cannot be accepted as impartial. It appears that the value of the gold already obtained at the last advices from the island was 120,000*l.*

Adelaide.—The advices by the present mail are to Sept. 28. Trade was dull, and was especially affected by the decline in the rates of two of the principal exports of the colony—copper and wool. The crops looked extremely well, and the clip of wool was likely to be heavy. The price of copper was 87*l.* per ton. Burra Burra shares continue to decline, and were at 116*l.* The banks were buyers of bills on England at 60 days' sight at ⅛ per cent. prem., and sellers at 2⅛ per cent. prem.

AUSTRALIAN MINES.

Kapunda.—The men were to commence working in the levels of the 50 and 60 fm. shafts on the 28th, the water being now out, and the levels quite dry. The lode had been cut at the 20 fms. in Charlotte shafts, and a winze was about to be placed on the lode to enable them to drive on it. The various tribute pitches were looking much as usual. The July ores were 275 tons, of 16 per cent. average produce, equal to about 44 tons of pure copper: the yield for August was estimated at about 220 tons. The 22 tons of copper forwarded to Melbourne have been shipped, per *Wellesley,* to London; a further parcel of 46½ tons had been forwarded to Melbourne for transhipment, and 84 tons were shipped, per *Sea Star,* Adelaide to London. All the furnaces were in full work, with a large supply of fuel at reduced prices.

Great Northen.—The local committee state:—"We have the pleasure to inform you that we have arranged for the shipment of 310 tons of copper ore from Port Augusta to London direct; the bills of lading cannot be got in time for this mail, but you will receive them by the next. The *Amicus* will load at Port Augusta in Oct., and the committee have made such arrangements as will secure a further shipment of ore by that vessel." Capt. J. B. Pascoe's report, dated Nuccaleena, Sept. 13, is as follows:—"Nuccaleena Mine: The lodes in sections Nos. 3, 5, and 8, are at the present time producing some good ore. The lode in sections 7 and 9 are good for copper ore, but are not worked at present. The 10 fm. level end is not holed to the shaft A as yet, but we hope to do so in two weeks from this date, when we shall be able to raise twice our present quantity of ore. The lode in the deep adit end is producing good ore. Since my last I have sent 36 drays loaded with ore to the port, several other drays will follow this week, and I know we have already sunk and driven through ground that will yield about 1500 tons more of good ore.—Oratunga Mine: We are raising very rich ore from the stopes in back of the 7 fm. level, and have sent 17 tons of ore to the port from this mine.—Mooroo Mine: We are raising some very good ore from the lode above the water level, but we are not deep enough for regular runs of ore. We have sent to the port 15 tons of very rich ore from this mine. I believe it is worth from 35*l.* to 40*l.* per ton. The operations at the Two Brothers, Wheal Stuart, and Chambers' Consols are progressing favourably."

North Rhine.—Capt. Barkla reports:—"I have much pleasure to inform you the shaftmen that are sinking Cope's engine-shaft have cut the main lode in the above shaft, about 5 fathoms below the 43 fm. level, on Sept. 20, but the men must sink the shaft down on it some way before they can cut into the lode, as it is both hard and wet at present. I have not the least shadow of a doubt but the lode will yield a large quantity of copper ore. I intend to have the engine-shaft sunk down to the 60 fm. level, and to have the lode cut in that level again, so that the men may be able to work the ground on a tribute that will leave a good profit to the company, as the tributers will raise a large quantity of ore."

Worthing.—Sept. 23: Legg's engine-shaft was set to sink by nine men; I trust this month's sinking will reach below the 43. The air-machine has been fixed in Legg's shaft, to ventilate the 33 south end, which had been extended 1 fm. 5 ft. 11 in.; the lode is poor in the last 4 or 5 fms. driving, but not without ore. I expect to cut the course of ore gone down from the 23 this month; if it continues the same dip north this, when accomplished, will increase our returns, and also greatly enhance the value of the property. The stopes in back of the 23 north, and south of No. 2 winze, will yield from 5 to 6 tons of ore per fm. of good quality. We have let a rise in back of the 23, against No. 3 winze, to four men; the lode is 3 ft. big of solid ore. The 23 end south is suspended, until ventilated by holing No. 3 winze. This end has been driven from 30 to 35 fathoms through a fine course of ore, and will average 2½ ft. big; lode in present end is small and poor; ground favourable. No. 1 winze has been sunk during the month 3 fms. 5 ft. 4 in., in a fine bunch of ore going down; we cannot say the size, it being more than the winze big. No. 2 winze has also been sunk 1 fm. 3 ft. 9 in. during the month; the lode in the bottom is 1½ ft. big, of good work; no water at present. We shall resume sinking No. 3 winze as soon as it is cleared up and windlass fixed. We have commenced a new drawing-shaft (Lean's) from surface, now down 5 fms.; this when holed to the 23 and 33 will be found very beneficial to draw through from the south part of the mine. All the machinery is working well. Dressing operations are progressing favourably. We have dressed and returned within the last two months upwards of 300 tons of ore of good per centage—say, 13 or 14 per cent. As soon as the other dressing-machine is completed we shall be able to very much increase our returns. Smelting is going on first-rate: one furnace turning out upwards of 7 tons of regulus of high per centage weekly. We have from 40 to 50 tons of wood delivering daily, and

are getting a good stock on the mine: 32 tons of regulus had been shipped per *Wellesley*, 44 tons were being shipped per *Orient* of 64 per cent. produce.

BON ACCORD.—At the date of last report the point where the winze lode, running north and south, was expected to be found has just been reached by the 50, driving west from engine-shaft. Instead, however, of the lode being found in a compact state and making ore, it appeared to be split into several branches. The operations, since the date of the last report, have consisted in driving north on the first branch met with, and in driving the level further west, with the view of finding more important branches or the lode in a more solid form, in the course of which work another branch has been cut. The level west has been driven 15½ fms. The driving north has been carried 3½ fms. The ground in the level and driving as described by Capt. Jeffery, is composed of spar, prian, some gossan, and some good stones of ore, but not yet good enough to value. The Chairman of the committee writes as follows:—"The cause of my disappointment is that the immense lode at the 40, just on entering settled country, should, instead of making solid at the 50, be apparently split into branches, if it be the same lode, of which Mr. Hamilton appears to have some doubt. We will, however, follow the branches, in the hope that some of them may make ore. The committee intend to continue explorations at as little cost as possible."

WHEAL ELLEN.—The directors have advices from Mr. Abraham Scott and the colonial committee to Sept. 26. Smelting operations had been commenced, and the reverberatory furnace and chimney referred to in former advices were expected to be be completed in about three weeks. The men were engaged chiefly in breaking ore and preparing it for smelting. They have 93 men employed, and hope that in about a month 2000*l.* worth of pig-lead will be shipped.

ENGLISH AND AUSTRALIAN COPPER.—The stock of coal was:—Coal at Kooringa, 419 tons; at Kapunda, 2337; at Port Adelaide, 1825. Wood at Kooringa, 2204 tons. There were six furnaces at work besides refineries.—New Port Works: The manager writes:—"We are very nearly ready to have fire into our furnaces. All the smelting furnaces are completed, and the refinery is partly finished." Coal has been found in the colony, and a company formed for working the same. The amount received on Clunes account was 3021*l.* 6s. 9d.; payments, 1092*l.* 13s. 1d., leaving a profit of 1928*l.* 13s. 8d. The cost of crushing per ton has been 9s. 4d., and deducting the calcining and delivery account, 7s. 2d.; this compares very favourably with last month's return, considering the diminished quantity of material passed through the machinery. This diminution in the supply of quartz is explained in the mine report for the previous month, and was caused by a slip in the upper portion of the mine, and the consequent delay in effecting repairs. The machinery was all in good order. The mine, on the whole, was looking well, especially the Eastern and Welcome veins. A remittance of 2000*l.* has been received by this mail.

PORT PHILLIP AND COLONIAL GOLD.—The quartz crushed during August was 2332 tons, and the yield of gold, 1734 ozs. 3 dwts. 16 grs., or an average of 14 dwts. 2 grs. per ton; a diminution in the quantity of material crushed, but a considerable improvement (2 dwts. 9 grs.) in the yield over the previous month.

CLUNES.—H. A. Thompson, Sept. 21: During the last month the supply of quartz has been well kept up, and there is little alteration to report in the mine.—Welcome Vein: They have now driven north on this vein about 80 ft. from No. 5 cross-cut, keeping by the west cheek. The quartz is of good quality, equal to that of the East vein.—East Vein: The stopes above the No. 3 level are now all taken out, and the only portion at work is a stope on No. 4 level, between the north and south engine-shafts, where the quartz is of very good quality.—Robinson's Vein: There are two stopes working on No. 3 level, between the engine-shafts, with quartz varying in quality, and another stope working above No. 5 level, in the south whim-shaft, with moderate quartz. A drive north is also going in the vein from No. 5 south cross-cut: here the vein is much broken, and does not look well.—West Vein: Three partnerships are now stoping on No. 3 level, between the engine-shafts, with quartz of fair quality; and one party is driving north from No. 5 south cross-cut, where the vein is 7 ft. wide, and the quartz good. The engine-house will be roofed in and finished in a few days. They are now cutting out pump-cistern at the north engine-shaft, and making other preparations for sinking the shaft. The case against the Yankee Company, for encroachment, has been decided in our favour.

SCOTTISH AUSTRALIAN.—The mining captain at the Good Hope Mine writes:—"We have Dickson's shaft carried down about 5 ft. deeper (say to 30 fms. 5 ft.), in order to form a fork or reservoir for the water, and commence driving a cross-cut east (or towards the lode), in the 30 fm. level, which has already been driven about 13 feet. We calculate on this cross-cut intersecting the lode in about 5 fms." Mr. Morehead, the superintendent, adds that the driving is being pushed on with all possible dispatch. As respects the Oaky Creek Mine (which will hereafter be called the Cadiangullong Mine), Capt. Christie reports (Sept. 14):—"About Aug. 20 we commenced the sinking of a large shaft, 10 ft. by 8 ft., on the south part of the lode. We were in the gossan for the first 18 ft., at which depth we struck the ore, which has increased in richness every foot that has been sunk. The shaft is now down 28 ft. in almost solid red oxide, carrying a proportion of native copper; we estimate the last 2 ft. has turned out 5 tons of ore that will average over 40 per cent. The 4 ft. above might fairly be set down at 10 tons of 25 per cent. Above that, again, it would not average 10 per cent. . . . . We judge that we have 120 tons of ore raised, the average produce of which it is at present impossible for us to say. The smelting-works, owing to the very wet weather we have of late had, I am sorry to say have progressed but slowly, but I hope, now that the weather is getting more settled, we shall be able to push on our operations with vigour. It is very important that we should at once take steps to get out copper smelters from Wales.—Sept. 18: We are now down in the shaft at the deepest part, 32 ft.; the lode here is as good as ever, in one place it has made in 'squats' rich yellow and grey ore. On Monday we blasted from the lode a block weighing over 9 cwts., a fair average of the lode at that depth (29 feet); an accident in getting it out has reduced it to about 6 cwts. I shall forward it to Sydney for the Great Exhibition of 1862." The following are extracts from the letter of Mr. Morehead, the superintendent:—"Since last writing I have spent several days at this property, and since my return to Sydney Mr. Christie's monthly report of the 14th, as also one of the 18th, of both of which copies are sent herewith, have been received. The intelligence these convey must, I think, be considered singularly favourable. . . . We may now, I think, take the entire width of the lode at 68 ft. . . . . I should mention as an important and favourable consideration that we may fairly keep in mind, that Mr. Christie speaks confidently of being able to smelt at a profit the easily-got and fusible ores of this mine, of as low a percentage as 5 per cent. This gives a great margin for diminution in the magnitude of the lode and in the richness of the ore. . . . I am inclined to share in Capt. Dalley's expectation that the lode will turn out a large sulphurous one. Preparations for those smelting-works were proceeding, when I was at the mine, as favourably as could be expected, and the orderly and business-like appearance of the whole establishment seemed to me most creditable to Mr. Christie. The busy character of the scene presented a singular contrast to what existed a few weeks before." The lode (the outcrop in which is very great) extends ½ mile through the property, and its width has been ascertained to be 68 ft. It is intended to cross-cut the lode at the bottom of the shaft, which is down 32 feet, to drive east and west on course of the lode in that level, and to carry the shaft down 10 or 15 fathoms deeper, respecting which Mr. Morehead observes, that as "they will be better down in the body of the lode than those cross-cuts that have been partially driven from the adit, will make us more exactly acquainted with the breadth of this wonderful formation." Mr. Morehead has communicated nothing of particular importance in his present letter respecting the Wellersley coal field, in the expectation of the early arrival at Sydney of the colliery manager, who left London on his way thither about two months ago.—[Feeling as we do so great an interest in all that concerns sound and legitimate mining enterprise, we are glad to see that there appears to be yet another remarkable mine opened up in the Australian colonies, and that in New South Wales too, whose mineral wealth, unlike that of Victoria and South Australia, has not as yet received very much of the attention of miners. The name "Oaky" is applied to various creeks in woody districts in the colony, and we think the name of the mine is well changed to "CADIANGULLONG," which is the name of the river, as marked on the Government maps of the part of the country where the property is situated.—ED. *M. J.*]

DUN MOUNTAIN COPPER.—The works of the Dun Mountain Railway are rapidly progressing, and a tender has been taken for the portion of the line through the town; the rails are being laid, and the ballasting will be finished about the end of October. The earthwork and bridging is complete, and the number of hands employed leave no doubt that the line will shortly be opened, when the chrome, slate, and timber will come down to Nelson in abundance. The passenger traffic in Nelson will likewise become an important feature in this undertaking, and altogether we can promise a bright future for the Dun Mountain Mines. The exciting news from the gold fields has done us no injury, as the plate-laying requires but few hands, and the contract from Brook-street to the port has been taken by Blyth and Carter, who have 40 men employed upon it.

COPPER MINING IN THE NORTHERN DISTRICTS OF SOUTH AUSTRALIA.—There is an improvement in mining, more particularly in the North, to which the public are giving more attention. Several new copper mines have been opened, and arrangements are made and being made for the carriage of the ores to Port Augusta, and very soon the North will probably rival Yorke's Peninsula. In several of the mines in the North it can hardly be called mining, ores of a rich quality being quarried at a rate which surprises miners of the old country.—*South Australian Advertiser*, Sept. 26.

GREAT NORTHERN MINING COMPANY.—We understand that Mr. Charles Bonney has been appointed manager in the colony of the Great Northern Mining Company, and that he may be expected to assume the duties of his office about January next.—*South Australian Register*, Sept. 26.

FOREIGN MINES.

LINARES.—Oct. 26: West of Engine-shaft—South Lode: The lode in the 95, west of Seguros winze, appears to be influenced by a slide passing near this point; we expect it will improve very shortly. The branch in the 85, west of Seville winze, continues very small. The lode in the 61, east of Warne's shaft, is small at present. The same level, west of ditto, is worth 1¼ ton per fathom; the lode is wide and vughy, letting out a great quantity of water. The 51, west of Toberneta winze, is worth ¾ ton per fm.; the lode is still small, but promising improvement. The lode in the 41, west of Crosby's shaft, is wide, and spotted with lead throughout.—East of Engine-Shaft: The 95, east of engine-shaft, is worth 1¼ ton per fm.; the lode looking very kindly indeed, containing large vughs, with lumps of lead. The 85, east of Ramiros winze, is worth 1½ ton per fathom; this end is again improved, and we expect it will open a long run of ore ground. The 75, east of Taylor's shaft, is worth 2½ tons per fathom; the lode is large, consisting of carbonate of lime, soft granite, and lead ore.—North Lode: The 75, east of Ordonez winze, is worth 2½ tons per fathom; the lode is 5 ft. wide, composed of calcareous spar and lead ore. The 65, east of Damasos winze, is worth ¾ ton per fm.; the lode is open and kindly, but no so productive as formerly.—Shafts and Winzes: At Santo Tomas engine-shaft the sumpmen are cutting ground at the 95. San Francisco shaft is worth ¾ ton per fathom; the lode is looking very kindly, chiefly composed of quartz and lead ore. La Suerte winze is worth ¾ ton per fm.; the lode is very wide, and spotted throughout with lead. San Eduardo winze is worth 1½ ton per fm.; this winze will be holed to the 85 in a few days. La Calle winze is down the required depth for the 65. Ochoas winze is worth 4 tons per fm.; the lode is greatly improved since our last report. Nicholas winze is worth 4 tons per fm.; there is also a great improvement in the winze, which is going down in a splendid lode. Casas winze is worth 1 ton per fm.; the lode has rather declined in this winze, being disarranged by a strong joint crossing the winze.—General Remarks: The stopes throughout the mine are looking moderately well. The weighing in from the dressing-floors for the last fortnight has been small, owing to the breaking of a cog-wheel of the eastern steam-whim; we expect a new one from Cordova daily. The changing of the boiler of Warne's engine has also kept back the stuff from that part of the mine. The masonry is proceeding in a very satisfactory manner. We estimate the raisings for November month at 400 tons.

FORTUNA.—Oct. 26: Canada Incosa—West of Taylor's Engine-shaft: The lode in the 7th level, west of Gomez winze, contains spots of lead, but not enough to value. The lode in the 6th level, west of O'Shea's shaft, is worth 1¼ ton per fm.; lode small and compact, and we expect it will improve again shortly. The 4th level, west of Rendon's winze, is worth 1 ton per fathom; lode chiefly composed of carbonate of lime and lead ore. The driving of the 3d level, west of Judd's shaft, will be resumed in a few days.—East of Taylor's Engine-shaft: The lode in the 4th level, east of Lowndes' shaft, is large, and looking kindlier than for some time past. The lode in the same level, west of ditto, is worth 2 tons per fathom, and is large and powerful, and leady throughout. The 3d level, east of Carro's shaft, is worth 1¾ ton per fathom; lode looking very promising, chiefly composed of barytes and lead. The lode in the 2d level, east of Bartholome's winze, is very small, and the ground hard for driving. Suez' winze is worth 1 ton per fathom; lode scarcely so productive as when last reported on.—Los Salidos Mine: The 5th level, east of Antonio's winze, is worth 2 tons per fathom; the lode continues of a very promising and productive character. There is no change in the end, west of Fernandes' winze, since our last. The 4th level, west Salvador's winze, is worth 4½ ton per fathom; lode greatly improved of late, and is opening very valuable ground. The lode in the same level, west of Cologan's shaft, is worth ⅛ ton per fathom; lode at present small and hard. The 4th level, west of San Pablo's shaft, is worth 1 ton per fathom; the same level, east of ditto, is worth at present about ⅛ ton of ore per fathom. There has been but little done in these last-mentioned ends since our last report, owing to the pitwork getting out of order; it is now repaired, and the driving resumed. The 3d level, east of Munos' winze, is worth ⅛ ton per fathom. The same level, west of Buenos Amigos shaft, is worth 4½ ton per fathom; lode very similar to that in the 4th level—we are only afraid of meeting with old workings. The lode in the 2d and 1st levels, east of San Miguel shaft, is evidently disarranged; our predecessors were unable to find the back of the lode at surface, and it is the opinion of most people here that there is a piece of sterile ground for about 60 fathoms wide.—Shafts and Winzes: The shaft-work being in very good order in Morris's engine-shaft, we hope to make good progress in sinking. The ground in San Gabriel shaft is rather hard. Olalla's winze is worth ⅛ ton per fathom; the lode has fallen off very much of late. Gea's winze is worth 2 tons per fathom; the lode continues very productive in this winze, which is one of the most important points in the mine.

COPIAPO—CHECO MINE.—Estimated produce for September:—

	Quantity.	Ley.	Price.	Value.
First class dark ore .....Qtls.	32	30	$26¼	$106
Second class green ore	64	15	9½	76
Third class yellow ore	128	14	8	128
Total..... Qtls.	224			$310

The stope in the back, west of Price's shaft, is producing 1 ton of 18 per cent. ore to the fathom. In the stope in the back of the 30 north the lode is producing 3 tons of 14 per cent. ore to the fathom. We have commenced a rise in the back of the 40, on the south lode, east of Price's shaft; the lode is 3 ft. wide, producing some good stones of ore. We have commenced to sink a new chiffon on another lode still more south; here the lode is 1½ foot wide, producing some very good stones of ore. In the old part of the mine there has been nothing done since Capt. A. Anthony has left. We shall soon commence in other parts of the mine.—GEORGE MATTHEWS.

LUSITANIAN.—Nov. 5: Palhal Mine: The ground in the 40 fm. level cross-cut, driving south of Oak shaft, is of a hard gneiss.—Basto's Lode: The lode in Taylor's engine-shaft, below the 60, is worth 2½ tons per fm. The lode in the 60, east of the same shaft, is worth ¾ ton per fm. In the same level west the lode is producing stones of ore. In the 50, west of Taylor's shaft, the lode is also producing stones of ore. In the 38, west of same shaft, the lode is 6½ ft. wide, with a branch of ore on the north side; at this point we have cut the Mill lode, that is situated between the caunter lode and Basto's lode, but as there has been but little opened on it we cannot say much about it. In the 50, east of River shaft, the lode is 4 feet wide, containing stones of ore. In the 28, east of the same shaft, the lode is 3 ft. wide, composed of quartz. In the 18, east of River shaft, the lode is 3½ ft. wide, composed of quartz, with small stones of lead and copper ore. In the adit, east of Pinto's shaft, the lode is 2½ ft. wide, composed of flookan and good stones of lead. In the 8, west of Abel's winze, the lode is split into branches, all unproductive. The same level, east of Perez whim-shaft, is of a similar character. In the adit, west of Perez whim-shaft, the lode is 2 feet wide, composed of quartz in a state of decomposition, and copper ore worth 1½ ton per fm. In the stopes No. 1, above the 50, west of Ernesto's winze, the lode is worth 2 tons per fm. In the stopes No. 2, above the 38, west of Clondino's winze, the lode is worth 1½ ton per fm. The stopes No. 3 are suspended. In the stopes No. 4, below the 28, west of Clondino's winze, the lode is worth 1⅛ ton per fathom. In the stopes No. 5, above the 38, east of Clondino's winze, the lode is worth 1 ton per fm. In the stopes No. 6, above the 50, east of Jackson's winze, the lode is worth 2 tons per fm. In the stopes No. 7, above the 50, west of Taylor's shaft, the lode is worth 1 ton per fm. In the stopes No. 9, above the adit, west of Perez shaft, the lode is worth 1 ton per fathom.—Mill Lode: In the 50, west of River shaft, the lode is worth 1 ton per fathom. In the 28, east of junction winze, the lode is 1½ foot wide, unproductive. In the 28, west of the slide lode, the lode is small, with stones of ore in it. In the stopes No. 10, above the 18, east of Dea's winze, the lode is worth ¾ ton per fm. In the stopes No. 11, above the 38, west of the caunter lode, the lode is worth 1 ton per fm. In the stopes No. 14, above the 50, west of River shaft, the lode is worth 2 tons per fathom. In the stopes No. 15, above the 38, east of Roderique's winze, the lode is worth 1 ton per fathom.—Caunter Lode: In the 38, west of Taylor's shaft, the lode is 1 ft. wide, producing stones of ore. In the 18, west of Taylor's shaft, the lode is worth 1½ ton per fm. In Luiz winze, below the 38, west of Taylor's shaft, the lode is producing 1 ton per fm.—Great Caunter Lode: In the 20, west of the Slide lode, west of Oak shaft, the lode is composed of quartz and small stones of lead. In the stopes No. 12, above the 20, west of Oak shaft, the lode is worth 1 ton per fm. of lead and copper ore mixed. In the stopes No. 13, above the 26, west of the Slide lode, west of Oak shaft, the lode is worth 2 tons per fathom.—House Lode: In the 30, west of Oak shaft, the lode is 6 inches wide, unproductive. In the 20, west of the Slide lode, west of Oak shaft, the lode is small and poor.—Ponte Lode: The lode in Lauranco's winze, below the adit, west of the River Caima, is 2 feet wide, composed of quartz and stones of ore. The rise above the 28 against Abel's winze is communicated to Abel's winze below the adit level.—Carvalhal Mine: The lode in the 10, east of Henrique's winze, is 3½ ft. wide, composed of quartz, mundic, biende, and lead, worth of the latter 1 ton per fm. We are going on with the preparations for the railway in shaft from surface to the 10 fm. level.

CLARENDON CONSOLIDATED.—J. Martin, Oct. 5: Stamford Hill Mine: The 94 cross-cut has been driven to date about 7 fms. 3 ft., through rather a hard rock, and have not as yet cut the lode, but by the increase of water, and the appearance of the rock, we are daily expecting to meet with it. The winze sinking below the 82 has been sunk to date 6 fms.; the lode is very large, and worth 6 cwts. of ore per fm., rather improved in appearance; its underlie is about 5 ft. in a fathom north-west, and the lode on which the shaft has been sunk underlying about 4 ft.; this will give us a little further distance to drive at the 94. The lode in the stopes in the back of the 82 is large, and worth ¾ ton per fm. The 82 cross-cut, north-west of the rock, is rather hard, being porphyry; we have two men driving this end, and as soon as convenient will put others to make four to push it on with all possible speed. In the 70 south-west, on south part of the lode, the lode is 5 ft. wide, and composed of killas, mundic, and prian, and letting out a little water. In the 46 south-west the lode is 3 ft. wide, consisting of gossan and oxides of iron, with a branch of flookan, about 4 in. wide, on the south wall: this end is letting out water freely. We have brought up the greater part of the work for the 6-in. plunger, but the late heavy rains have made the roads in such a state that it has put a stop to our doing much, but as soon as the weather clears up a little there shall be no time lost in getting up the remaining parts, so as to get the 6-in. plunger in its place at the 82. We are still dressing up the ore taken from the smalls and the prills, which we are taking from the rough. I hope by the end of this month to make a further addition to the dressed ore already taken down to wharf. The undressed ore shall be taken down as fast as the cattle will allow us to work them.—P.S. The rock at the 94, that we are now driving through, is an elvan course, which I should say is a good sign, as I have never seen a lode fail in making ore where the elvan kept by its side, be it east or west; this being on the east side, I hope soon to prove this by cutting the lode and extending the level on its course. You may rely on my pushing on every part of the work as fast as possible.

— Stamford Hill, Oct. 23: We have cut the north part of the lode in the 94, but the rock being so hard, and not far south of the cross-course, it is small, being about 2 ft. and composed of porphyry, with spots of ore. The cross-cut by which we have cut the lode is 6 or 7 fms. to the east of the winze sinking below the 82, and 10 fathoms east of where we had the ore in the 82. I think the shoot of ore we had at this level is dipping south-west. This will give us more distance to drive in the 94 to get under the orey ground we have had in the above-named level. The lode in the winze sinking below the 82 is 3 ft. wide, consisting of quartz and peach, with iron, and worth 6 cwts. of ore per fm. We have sunk this winze about 8 fms. below the 82, and have had some ore all the way. The stopes in back of this level show the lode large, and worth ¾ ton of ore per fm. In the cross-cut driving north-west of the north part of the lode in the 82 the rock is not so hard as last reported, and the end is now letting out more water. The lode in the 70 south-west is 4 ft. wide, and composed of light killas, prian, and mundic, with spots of ore. The lode (new lode discovered recently, supposed to be Charing Cross main lode) in the 46 south-west, is 6 ft. wide, and worth 1 ton of ore per fm.; as promising a looking lode as ever has been seen at Stamford Hill Mine. It contains yellow ore and black oxide, with green carbonates and native copper. Such a thing has never been seen at this mine since I have been here before. This level has been driven within a few fathoms of the Queen's-road, the line between Thomasland and the Stamford Hill Mine (see plan). They have another such lode in the 65, or deepest adit level, at the Charing Cross Mine, when they stopped working. Captain Francis says the lode was 4 ft. wide, and bespangled with ore for that width. I find the distance from our present end in the 46 to where they have driven in the Charing Cross Mine not more than 440 fms. from point to point; this is a rough guess, but as soon as the weather improves I will ascertain the exact distance. We have the undressed ore which you have ordered to be sent home still at the mine; when we shall be able to get it at the wharf it is hard to say, in consequence of the heavy rains; you may, however, rely on my sending it down for shipment as soon as the roads are practicable, with the dressed ore.

CENTRAL AMERICAN.—Alotepeque, Sept. 28: All our mining operations have been progressing very favourably throughout the month.

— Oct. 1: During last month nothing has happened to interfere with the satisfactory progress of all our operations. Common labourers have been very abundant, and we never had so many hands before applying for work. You will be pleased to see Cornubia shaft down to the required depth for driving east and west a 20 fathom level. The San Juan end east (10 fm. level) has been rather poor lately, and altogether the ore has not been so rich, still the production of 64 tons 7 cwts. in four weeks' working, and giving, according to assays, 9342 ozs. of silver, is not bad at all. I have dispatched during September, for transmission to England, 14 tons 11 cwts. of first-class ore—[N.B. This ore has arrived]—and there remain in store, ready for transmission, 37¼ tons of similar quality. At the reduction works 22 charges of the 8 barrels were made in the month, the quanty of ore reduced being 110¾ tons; 15 bars of silver were produced, weighing 1306 marcs, which, with 5 more bars, would be sent to the Mint on October 7.

COAL-HEWING MACHINERY.—An invention, which relates to a mode of working minerals, whereby a saving of labour and prevention of breakage is effected, has been patented by Messrs. Ridley and Rothery, of Low Wortley and West Ardsley. According to this invention, it is proposed to hew or work seams of coal and other mineral strata, by making a narrow undercut in a horizontal or nearly horizontal direction, and also one or more narrow vertical cuts on the face of the coal or mineral, the depth of all such cuts vary according to the size of the block required; a series of holes are then drilled along the upper part of the intended block in a horizontal direction, in order to facilitate the detaching of the block. One arrangement of machinery which they propose to use for effecting the cutting operations above referred to consists of a suitable framing, mounted on wheels, and provided at the top and bottom with a horizontal, transverse, rocking shaft, and at the two opposite sides with similar shafts, placed in a vertical position. Each of these shafts carries one or more vibrating arms keyed thereon, and these arms are each provided at their outer free ends with a suitable cutter for acting upon the coal or other substance to be worked. A vibratory or oscillating motion is imparted to these arms by the aid of a crank and ratchet-wheels, in combination with helical springs on the shafts, the springs serving to give the necessary blow or stroke for effecting the cut, whilst the crank and ratchet-wheels return the arms to their original positions again in readiness for a fresh stroke. The entire machine is moved up to its work by a self-acting or other travelling motion.

One of the finest pearls in the world has recently been found in the Bay of Panama. It is of a perfect pear shape, and of the finest water.

ST. JUST UNITED TIN AND COPPER MINING COMPANY

(LIMITED), IN THE PARISH OF ST. JUST, NEAR PENZANCE, IN THE COUNTY OF CORNWALL.

Incorporated under the Joint Stock Companies Acts, 1856 and 1857.

Capital £15,000, in 15,000 shares of £1 each. Deposit on application 5s., and 2s. 6d. on allotment.

The balance, if required, to be paid by instalments of 2s. 6d. per share, to be made at intervals of not less than three months.

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AUDITORS—Messrs. Cooper Brothers and Co., 13, George-street, Mansion House, London.

SECRETARY—E. Evans, Esq.

OFFICES,—23, MOORGATE STREET, CITY, LONDON.

This company is established for purchasing and working the extensive and valuable tin and copper mines, called the St. Just United, in the parish of St. Just, near Penzance, Cornwall, and situate in a district which is one of the most productive in the county, and has become distinguished by the rich returns and profitable results of mining operations carried on within it. The undermentioned mines, which are producing immense quantities of ores, and continue paying large dividends to the shareholders, are immediately adjoining and contiguous to the one under notice:—

Names of Mines now working, paying dividends.	No. of Shares	Amount paid per share.	Dividends paid per share.	Original outlay.	Total Amnt. of dividends paid.	Present market value.
Levant (tin & cop.)*..	160	£2 10 0	£1091 0 0	£ 400 0 0	£174,560 0	£ 16,000 0
Botallack (tin & cop)*	200	91 5 0	445 15 0	18,250 0 0	89,150 0	48,000 0
Wheal Owles (tin)†..	80	70 0 0	280 13 0	5,600 0 0	22,452 0	24,000 0
Balleswidden (tin)†..	1624	11 15 0	12 5 0	19,082 0 0	19,894 0	19,488 0
Boscean (tin)†.....	240	20 10 0	33 0 0	4,920 0 0	7,920 0	12,000 0
Spearne Moor (tin)†..	280	31 17 9	9 15 0	8,928 0 0	2,730 0	12,600 0
Carnyorth (tin)†	2048	3 10 0	0 19 6	7,168 0 0	1,996 16	7,168 0
	4632	231 7 9	£1873 7 6	64,348 0 0	£318,712 16	£139,256 0

* Decomposed granite, slate, and greenstone. † Decomposed granite.

The above seven mines, on an outlay of £64,348 on the present working, have already paid back in dividends to the shareholders £318,712 16s.

As the before-mentioned mines stand prominent in the dividend-paying list, it may not be out of place to state also that Botallack Mine has given back to the shareholders in its former workings upwards of £250,000; Boscaswell Downs Mine upwards of £40,000, and again resumed working by a new company; Wheal Cunning upwards of £25,000; Boscean Mine upwards of £15,000; and Spearne Consols for an outlay of £1280 upwards of £10,000; thus making a total sum five mines have paid back in dividends to shareholders of £340,000.

PROGRESSIVE MINES.

Names of mines working.	Shares	Original outlay.	Market value.		Geological position.
Pendeen Consols (cop.)..	5000	£18,000 0 0	£ 28,780 0 0	Decomposed	granite, slate, & greenstone.
Boscaswell Downs (tin)	1248	7,800 0 0	9,984 0 0		granite.
Wheal Hearle (tin)	1024	7,680 0 0	15,360 0 0		granite.
Boswedden (tin)	123	3,936 0 0	3,936 0 0		granite and greenstone.
Bosorn (tin)	160	1,000 0 0	1,600 0 0		granite.
		£ 38,416 0 0	£ 59,660 0 0		

The setts are very extensive on the course of the lodes, and have been granted at the very moderate royalty of 1-24th dues for the term of 21 years, and upon the usual mining conditions. Fourteen rich tin and copper lodes, and three cross-courses pass through this ground; some of these lodes have been wrought on, and, so far as they have been opened, have proved very productive, and will, no doubt, at a deeper level prove richer and lasting in their downward courses. This, in fact, has actually been the result in every mine in the district.

The geological position of this extensive and valuable mining property cannot be surpassed in the county. It is in beautiful strata, quite congenial for producing tin in the granite, and copper in the killas (clay-slate) immediately adjoining the granite, precisely of the same character as Botallack, Levant, Pendeen Consols, and other mines in the district.

These mines lie immediately adjacent to the rich Botallack, Levant, and other mines, all making large dividends, and producing tin in the granite inland, and copper ore in the killas under the sea. All these mines exist under such geological parallels, that it is almost impossible to overlook the fact that they cannot fail under good management to become highly profitable; so much so, that in a long catalogue of all the surrounding mines, not one but has proved a most excellent investment for capital.

With reference to these special mines, the lodes in them which have been worked for tin for centuries have proved so profitable that the waste heaps seem inexhaustible, and after being worked over the third or fourth time are now affording great profits.

There are immense stores of tin now lying underground, which were broken when that metal was worth about £40 per ton, but it is now worth £76 per ton, and may consequently now be prepared for market at considerable profits.

There is an immense field of tin ground, containing 14 lodes, in the grant. These have been partially worked to an inconsiderable depth, (say) 60 fms. under adit; but only to afford evidence that there remains an unlimited supply below, which may be worked to extraordinary profits under the favourable circumstances of the prevailing high prices of tin, low prices of mining materials, and the improved steam-power of the age.

The copper ore ground is yet untouched: the 40 and 62 have nearly got into the deposit.

Some very beautiful specimens of blistered copper ore may be seen in the offices of the company, broken in the last day or two of working in the 40, by the last workers; but the levels, although close to the copper formation, have not been carried into it, and some idea of its extent and value may be formed from the evidence of a similar range of copper ore ground worked in Botallack Mine, which has given as much as £24,000 per annum profit.

There can, therefore, be no doubt but that this mine is actually teeming with certain and abundant mineral wealth, as it is the united opinion of persons competent to speak on this mine, that when it shall have been set to work the profits that will accrue therefrom will place it in a position second to none in the district for the outlay.

The proprietors, after an unusually rigid enquiry and careful inspection of these mines, have the greatest confidence in bringing their property before the public, and they feel satisfied, by established facts, that a more promising and advantageous investment, and one more free from any speculative feature, has never before been offered to the public.

A reference to the section and sketch of the sett will better illustrate the position of the lodes of these mines.

It must be conceded that in such an immense run of old mining work as is found in an ancient tin mine that a considerable sum will be necessary to bring the whole of the workings into systematic order and profitable produce; hence the prudence of providing a sufficiency of capital.

It is calculated that calls of 2s. 6d. per share will not be required at periods oftener than three months.

It cannot be considered that there is any speculation whatever in the concern, but a pure investment of capital; for it will be seen from the several reports given by practical mining engineers, that they fully bear out the sanguine views entertained, that a much less sum than the proposed capital will be ample to put up all requisite machinery, and get the mine in good working order, so as to render the same a dividend-paying mine.

The proprietors have been to a considerable expense in purchasing this valuable property. Therefore, out of the proposed capital of £15,000, they have agreed to take £2000 in cash, and £3000 in paid-up shares, being for work already done, securing the lease, and paying all preliminary expenses, thus leaving £10,000 for working capital, which is considered more than ample to carry out all the work necessary to place the mine in a dividend position.

Full prospectuses, plans, and reports, and any other information, may be obtained of the secretary at the offices of the company, or from ALEXANDER YOUNG, Esq., and EDMUND SOILLEUX, Esq., Stock Exchange. Applications for shares to be addressed either to the directors, or to the brokers of the company.

REPORT.

Report of Capt. JOHN CARTHEW, M.E., who was formerly the principal officer of the Bolivar Mining Association, Venezuela, South America; managing agent of Balleswidden, Pendeen Consols, Boscean; now of Spearne Consols and Carnyorth Mines:—

St. Just, near Penzance.—These extensive and valuable mines, which you have so fortunately secured, are situated in the parish of St. Just, about five miles north of the Land's End, and seven miles west from Penzance, in the county of Cornwall; they extend upwards of 400 fathoms east, 600 fathoms from north to south, and to an unlimited extent westward under the sea. The sett is traversed by fourteen well-defined and known rich tin lodes, bearing north by west and south by east in the granite; there are also two caunter lodes crossing the entire sett, and where these have intersected the other lodes the "old men" had valuable and rich tin ground, yielding very large quantities of ore, above the level of the sea. Fifty years ago a deep level was taken up from high-water mark, extending eastward about 300 fathoms on the course of the lodes. A shaft was also sunk below the deep level, by the aid of a water-wheel, at Wheal Bellan, on the Buck lode, which, in extending eastward and westward on three lodes, good courses of tin were discovered, but in consequence of the want of sufficient water-power at all times to work their wheel, so as to keep the mine dry, and the low price of tin at this time (£38 to £40 per ton), made the working too expensive, and the adventurers were reluctantly compelled to abandon operations, although they had at that time cut a fine lode of tin on the caunter lode (Wheal Owles), and had extended the 20 fathom level through valuable ore ground. The miners were working at a great disadvantage in sinking winzes in the bottom of the level on tribute. Ten parties were thus engaged in sinking, varying from 12 to 14 fms. in depth, leaving good courses of tin holding away and down in the bottom from 80 to 100 fms. in length, worth upwards of £20 per fathom. At this period there were more miners working in these mines than in all the other mines in St. Just parish. The 62 fm. level is sunk 30 fathoms below the ground discovered on Wheal Owles lode; and if an engine were erected in the present engine-house now on your mines, and suitable heads of stamps attached to the same, you could not fail to send tin to market within one month after the engine went to work. I never saw so fine a channel of mineral ground in the West of Cornwall. To comment on the district would be surperfluous; suffice it to say that it is in a decomposed granite. The mines hitherto opened, and worked judiciously, have paid, and are now paying, large dividends regularly — viz., Balleswidden, Boscean, Wheal Owles, Botallack, Spearne Moor, Levant, Boscaswell Downs, &c. There is upwards of £1000 worth of tinstuff now on surface at St. Just United Mines, and the reports from the old miners declare that there is more than £2000 worth of tin broken underground, which can be taken away and returned, as soon as the engine is set to work, at a very great profit. The point for copper mining, which I would strongly call your attention to, will be at the junction of the lodes running under the sea, where the granite and killas meet. The Bottallack, Levant, and Pendeen Consols copper lodes are parallel with those of the St. Just United to the north, and are situated on the same edge of the cliff, have precisely the same mineral character, are embedded in the same decomposed granite inland, and in the killas under the sea. A fine copper lode was discovered in the end of the 40, west of engine-shaft, from which some excellent stones of grey ore were broken. With such an extensive run of orey ground, embracing as it does such a cluster of lodes in the ends of the 20, 30, 40, and 62, and as they are converging and forming together a great trunk of copper in their junction in the great Savall's lode in this great trunk or copper lode, there can be no doubt, or two opinions, but that an immense amount of copper will be found west-

ward in the killas under the sea. It will not be out of place if I mention here the great advantages that the new proprietary will derive from the work already done at surface and underground, and which will save time and money, and enable you at once to make returns and sales of ores, and I estimate the expenditure hitherto has been—sinking 10 shafts, making 535 fms., at £8 per fm., £4280; cutting down the engine-shaft, and making the same in good working order, 66 fms., at £10 per fm., £660; sinking the engine-shaft from the 40 to the 62 fm. level, 22 fms., at £20 per fm., £440; cutting whimpiat at the 62 fm. level, £30; driving cross-cuts to cut the lodes, £200; extending the 62 west into the copper ground, 40 fms., at £6 per fm., £240; ditto east in tin ground, 300 fms., at £4 per fm., £1200; removing debris for foundation of engine and boiler-house, and building the same, £220. Therefore, making a total of £7270 has been laid out in sundry work for the benefit of a new company; and I consider that in six months after the operations have fairly been commenced on the mines, the engine and stamps erected, and the work carried on vigorously, that the company will be in a position to return tin and copper, and also to pay regular dividends. Having been a superintendent mining agent at home and abroad upwards of 42 years, I feel proud in having the honour of recommending these mines to your notice, and I can with confidence say there is nothing again like them; and looking at the sett throughout, and duly considering every point connected with it, I cannot come to any other conclusion than that you possess a most valuable property.

JOHN CARTHEW.

PATENT BITUMINIZED GAS, WATER, AND DRAINAGE PIPES.—These PIPES POSSESS all the PROPERTIES NECESSARY for the CONVEYANCE of GAS and WATER, and also for DRAINAGE PURPOSES—viz., GREAT STRENGTH, GREAT DURABILITY, and PERFECT INOXIDABILITY, and being non-conductors are not affected by frost, like metal pipes. They are proved to resist a pressure of 220 lbs. on the square inch (equal to 500 ft. head of water), are only one-fourth the weight, and considerably cheaper than iron pipes. They are made in 7 ft. lengths, and the joinings are simple and inexpensive. These pipes have been in use in France, Spain, and Italy nearly three years, where the demand for them is very great. The opinions of the press on a public test at the Houses of Parliament, before a large number of engineers and other scientific gentlemen, may be had, with further particulars, at the office of the company, on application to Mr. ALEX. YOUNG, 14A, Cannon-street, London, E.C., where sample pipes may be obtained for trial.

GAS AGAIN.—Another fearful fire, at No. 5, Richard-street, Limehouse-fields, caused by an escape of gas. This could not have occurred had one of HUGHES'S PATENT SAFETY ATLAS INDICATING CHANDELIERS been used. All persons having gas fitted should, therefore, have the IMPROVED ATLAS CHANDELIERS FIXED. Kept in stock by all gas-fitters. Drawings free by post, and a large stock always ready for the trade and merchants at the Atlas Works, No. 96, Hatton-garden. R. H. HUGHES.

THE PARAFFIN, OR MINERAL OIL SAFETY GAUGE, made for the Asphaltum Company (Limited), ENABLES CONSUMERS to AVOID PURCHASING PARAFFIN or MINERAL OIL of an EXPLOSIVE or DANGEROUS KIND. Price, with a tin oil holder, 1s. 6d. each; forwarded by post upon receipt of 18 stamps.—Apply at the offices of the company, 34, Great Winchester street, London, E.C.

WOTHERSPOON'S SCOTCH WHISKEY can now be supplied genuine as in Scotland, at WOTHERSPOON, MACKAY, AND CO.'S, 66, QUEEN STREET, E.C., in single bottles, or in quantity, price 3s. 8d. per bottle; 42s. per dozen.

LAKE SUPERIOR, U.S.—Mr. G. W. HAMBLIN, Post Master, Negaunee Post-office, Marquette County, Lake Superior, U.S., has opened an office as above, for the purpose of supplying mineralogical specimens generally, but more particularly such as are peculiar to the district, to museums and collectors throughout the world. From his acquaintance with the different localities on the Lake, and with mining captains, he has facilities for collecting minerals, also for procuring the rarer sorts. Residing in the centre of the iron district, Mr. Hamblin can furnish specimens of ores of great beauty as cabinet specimens, of which the mammillary and stalactitic forms of hematite are worthy a place in any cabinet. He can also supply specimens of native copper and silver, with the accompanying minerals, many of which occur as crystals, forming rare objects of interest to the collector. Collections made up of all sizes and states of completeness, from the value of $25 (or £5 sterling) to $200. Letters of enquiry or conveying orders must be post paid.—P.S.—On receipt of £5 sterling Mr. Hamblin will forward a set of iron specimens; also, native copper and silver.

Crystals as follows will be supplied at from $2 to $4 each:—Quartz, calc spar (Dog Tooth and other varieties), epidote, greenstone, prehnite (with copper), black oxide copper, analcime, chlorastrolite (found only at Isle Royale), native copper (crystallised), calc spar (with radiated epidote), ripple marked quartz (from the metamorphic strata), and a large variety of others illustrative of the geology and mineralogy of this part of the world.

On account of convenience of remittance, the smallest collection which can be forwarded will be $25 (or £5 sterling).

LEICESTER AND CO. (late Leicester, Brache, and Teague), CONSULTING MINING ENGINEERS AND SURVEYORS, AND GENERAL MINING AGENTS, MELBOURNE, VICTORIA, PROCURE MINING LEASES on ELIGIBLE TERMS from the GOVERNMENT of VICTORIA and NEW SOUTH WALES, on receipt of a remittance for £200, to cover costs of lease, survey and report, &c. Messrs. LEICESTER and Co. OFFER to TAKE the MANAGEMENT of MINING COMPANIES, and PROVIDE OFFICE ACCOMMODATION, for a percentage on the profits of the company.

For further particulars, apply to Mr. RICHARD MIDDLETON, *Mining Journal* office, 26, Fleet-street, London, E.C.

All remittances must be made through our bankers, the Union Bank of Australia.

TO ADVENTURERS IN FOREIGN MINES.—Mr. HARRY THOMAS VERRAN, of PLACENTIA, NEWFOUNDLAND, who has had considerable experience (under the tuition of his father, and in connection with many other experienced Mining Engineers) is ready to UNDERTAKE the EXAMINATION and REPORTING upon MINERAL PROPERTIES in Newfoundland, the United States, or any other country, where his services may prove useful to capitalists. The greatest confidence may be placed in Mr. VERRAN, who will use his best judgment in giving reliable information to those who may repose confidence in him.

INVESTMENTS IN BRITISH MINES.—Mr. MURCHISON publishes a QUARTERLY REVIEW OF BRITISH MINING, giving at the same time the POSITION and PROSPECTS of the MINES at the end of each Quarter, the DIVIDENDS PAID, &c.; price One Shilling. RELIABLE INFORMATION and ADVICE will at any time be given by Mr. MURCHISON, either personally or by letter, at his Offices, No. 117, BISHOPSGATE-STREET WITHIN, LONDON, where copies of the above publication can be obtained.

OPINIONS OF THE PRESS ON Mr. MURCHISON'S WORK ON BRITISH MINING, PUBLISHED IN 1856.

Mr. Murchison's new work on British Mines is attracting a great deal of attention, and is considered a very useful publication, and calculated to considerably improve the position of home mine investments.—*Mining Journal.*

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Mr. Murchison takes sound views upon the important subject of his book, and has placed, for a small sum, within the reach of all persons contemplating making investments in mining shares that information which should prevent rash speculation and unproductive outlay of capital in mines.—*Morning Herald.*

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With such a work in print, it would be gross neglect in an investor not to consult it before laying out his capital.—*Poole Herald.*

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The *Ironmonger* is published on the last day of every month, and supplied to the trade only for the sum of 5s. per annum, post free. It contains Leading Articles, Mirror of the month, List of Contracts open, Extracts, Trade Reports, Price Currents and Statistics, Reports of Trade Meetings, &c., List of English and Foreign Patents, and Novelties (illustrated when necessary), Correspondence, Gazette, and other matters interesting to the trade, specially selected and arranged for its columns.

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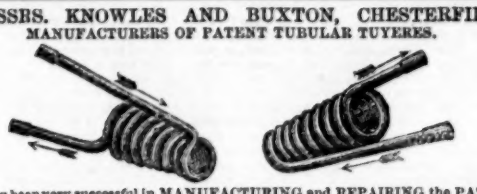

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No. 1 Tuyere,	16 in.	long	28s. each.
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BY HER MAJESTY'S ROYAL LETTERS PATENT.

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W. BUTLIN, VULCAN WORKS, WESTON STREET, NORTHAMPTON.

TESTIMONIALS.

Leadenhall-street, London, E.C., July 3, 1860.

DEAR SIR,—Having applied your patent steam superheater to the boiler of our steamship, *City of Nantes*, we have great pleasure in being able to state that your apparatus effects a saving of at least 30 per cent. in the consumption of fuel, besides giving additional speed upon the screw. We do not hesitate in giving our opinion that your invention is a most important one, and one which must come into general use. We approve of your arrangements for admitting saturated steam with the superheated, to regulate the temperature at pleasure. Your plan of filling the heater with water during the time steam is being got up we think is quite a new idea, and remedies one of the great objections to superheaters generally—the rapid destruction of the tubes by the fire while steam is getting up. You are at liberty to make what use you please of this letter, as we think so valuable an invention ought to be made known to the steam shipping interest of this country. We are, dear Sir, your's truly,

W. Butlin, Esq., Northampton. —— LANGTON AND WILSON.

Little Houghton, Northampton, July 29, 1861.

DEAR SIR,—We have given our engine a sufficient test, both in thrashing and sawing, since the introduction into it of your superheater, to enable us to speak confidently of the great improvement made by the alteration. We believe that your advertisements do not exaggerate the excellence, in any respect, of your patent. Many respectable parties who witnessed the working of the engine are willing to bear testimony to the truth of our statements. We remain, dear Sir, yours very truly,

—— SMITH AND THURSTON.

Naseby, Northampton, Aug. 24, 1861.

SIR,—I have much pleasure in being able to state that since your patent steam superheater has been applied to my engine I find a considerable reduction in the consumption of fuel, much less water is required to feed it, and a great increase of power is obtained. I am much pleased with the alteration. —— Yours truly, L. WILFORD.

Earl's Barton.

SIR,—I am well satisfied with the alteration made in my engine, as it takes less coal and water since your heater has been introduced into it.

Yours truly, CHRISTOPHER COLEMAN.

BASTIER'S PATENT CHAIN PUMP, APPARATUS FOR RAISING WATER ECONOMICALLY, ESPECIALLY APPLICABLE TO ALL KINDS OF MINES, DRAINAGE, WELLS, MARINE, FIRE, &c.

J. U. BASTIER begs to call the attention of proprietors of mines, engineers, architects, farmers, and the public in general, to his new pump, the cheapest and most efficient ever introduced to public notice. The principle of this new pump is simple and effective, and its action is so arranged that accidental breakage is impossible. It occupies less space than any other kind of pump in use, does not interfere with the working of the shafts, and unites lightness with a degree of durability almost imperishable. By means of this hydraulic machine water can be raised economically from wells of any depth; it can be worked either by steam-engine or any other motive power, by quick or slow motion. The following statement presents some of the results obtained by this hydraulic machine, as daily demonstrated by use:—

1.—It utilises from 90 to 92 per cent. of the motive power.
2.—Its price and expense of installation is 75 per cent. less than the usual pumps employed for mining purposes.
3.—It occupies a very small space.
4.—It raises water from any depth with the same facility and economy.
5.—It raises with the water, and without the slightest injury to the apparatus sand mud, wood, stone, and every object of a smaller diameter than its tube.
6.—It is easily removed, and requires no cleaning or attention.

A mining pump can be seen daily at work, at Wheal Concord Mine, South Sydenham, Devon, near Tavistock; and a shipping pump at Woodside Graving Dock Company (Limited), Birkenhead, near Liverpool.

J. U. BASTIER, sole manufacturer, will CONTRACT to ERECT his PATENT PUMP at HIS OWN EXPENSE, and will GUARANTEE IT FOR ONE YEAR, or will GRANT LICENSES to manufacturers, mining proprietors and others, for the USE of his INVENTION.

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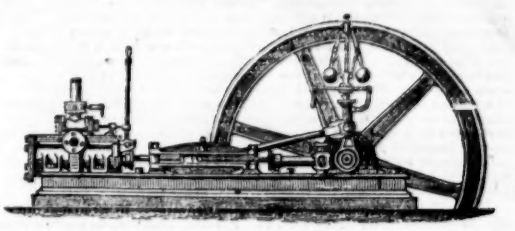

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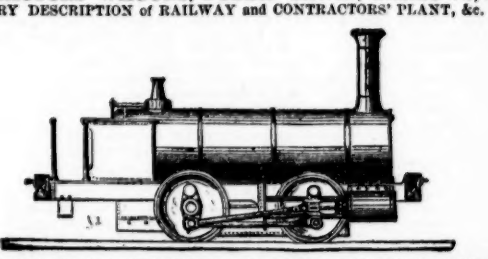

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